

CLAIMS

1. A printing method for printing an image onto a medium, the method comprising:

5 printing a correction pattern by ejecting ink from a plurality of nozzles moving in a predetermined movement direction and forming, in an intersecting direction intersecting the movement direction, a plurality of lines extending along the movement direction and constituted by a plurality of dots;

10 measuring a darkness of the correction pattern line by line; and
printing the image with a plurality of the lines formed in the intersecting direction, while correcting the darkness of each line in accordance with correction values each corresponding to the darkness of each of the measured lines.

15 2. A printing method according to claim 1,
wherein a plurality of the lines are formed in the intersecting direction by repeating in alternation a dot formation operation of forming dots on the medium by ejecting ink from a plurality of the nozzles moving
20 in the movement direction and a carrying operation of carrying the medium in the intersecting direction.

3. A printing method according to claim 2,
wherein a printing apparatus printing the image onto the medium,
25 includes a plurality of types of processing modes for respectively executing print processes in which at least one of the carrying operation and the dot formation operation differs;

prints, with at least two of the processing modes, a correction pattern corresponding to each of the processing modes on a
30 medium, and has the correction values, which are obtained by measuring the darkness of the correction pattern line by line, in correspondence with each line; and

corrects the darkness of the image line by line, in accordance with the correction values corresponding to each line of the
35 image, when printing the image in any of the processing modes with which

the correction pattern was printed.

4. A printing method according to claim 3,

wherein the correction pattern corresponding to each of the processing modes is printed to fit on a single medium.

5. A printing method according to claim 1,

wherein a plurality of the nozzles is lined up along the intersecting direction to constitute a nozzle row.

6. A printing method according to claim 5,

wherein a printing apparatus printing the image onto the medium comprises the nozzle row for each color of ink;

the correction value is prepared for each of the colors by printing the correction pattern for each of the colors; and

the darkness of the image is corrected color by color, based on the correction values for each of the colors.

7. A printing method according to claim 3,

wherein the at least two processing modes include at least either a downstream edge processing mode for printing an image at an edge portion on a downstream side, with respect to the intersecting direction, of the medium, and an upstream edge processing mode for printing an image at an edge portion on an upstream side, with respect to the intersecting direction, of the medium.

8. A printing method according to claim 7,

wherein the downstream edge processing mode and the upstream edge processing mode respectively are modes for printing an image provided without a margin at the edge portion.

9. A printing method according to claim 7,

wherein the downstream edge processing mode and the upstream edge processing mode respectively include modes for printing an image provided with a margin at the edge portion.

10. A printing method according to claim 7,

wherein the correction pattern printed by the upstream edge processing mode is printed at the edge portion on the upstream side of the medium.

11. A printing method according to claim 7,

wherein the correction pattern printed by the downstream edge processing mode is printed at the edge portion on the downstream side of the medium.

12. A printing method according to claim 7,

wherein the at least two processing modes include an intermediate processing mode for printing an image on a portion between the edge portion on the upstream side of the medium and the edge portion on the downstream side of the medium with respect to the intersecting direction.

13. A printing method according to claim 12,

wherein the intermediate processing mode and at least one of the downstream edge processing mode and the upstream edge processing mode have a different carry amount in the carrying operation.

14. A printing method according to claim 1,

wherein there is also a correction value for a region that is judged to be further upstream than the edge portion on the upstream side, or for a region that is judged to be further downstream than the edge portion on the downstream side in the intersecting direction of the medium on which the image is printed; and

this correction value is obtained by arranging the medium at a position corresponding to the region, printing the correction pattern on this medium, and measuring the darkness of this correction pattern line by line.

15. A printing method according to claim 1,

wherein ruled lines extending along the movement direction for

specifying a line during the measurement when measuring the darkness of the correction pattern line by line are formed in the correction pattern at a predetermined spacing in the intersecting direction.

5 16. A printing method according to claim 1,

wherein image data for printing the image is prepared, and the image data has a gradation value of the darkness for each dot formation unit formed on the medium;

10 if a correction value is not associated with the formation units, then a creation ratio corresponding to the gradation value of the formation units is read from a creation ratio table in which gradation values are associated with dot creation ratios, and dots are formed in the formation units on the medium in accordance with the read creation ratio; and

15 if a correction value is associated with the formation units, then when reading the creation ratio corresponding to the gradation value from the creation ratio table, the creation ratio corresponding to a value obtained by changing the gradation value by the correction value is read, and dots are formed in the formation units on the medium
20 in accordance with the read creation ratio.

17. A printing method according to claim 1,

25 wherein image data for printing the image is prepared, and the image data has a gradation value of the darkness for each dot formation unit formed on the medium;

if a correction value is not associated with the formation units, then a creation ratio corresponding to the gradation value of the formation units is read from a creation ratio table in which gradation values are associated with dot creation ratios, and dots are formed in
30 the formation units on the medium in accordance with the read creation ratio; and

if a correction value is associated with the formation units, then a dot creation ratio corresponding to the gradation value of the formation unit is read from a creation ratio table obtained by changing
35 the creation ratio of the above-mentioned creation ratio table by the

correction value, and dots are formed in the formation units on the medium in accordance with the read creation ratio.

18. A printing method according to claim 16 or 17,

wherein the dot creation ratio indicates a proportion of a number of dots formed inside a region that has a uniform gradation value and that is provided with a predetermined number of the formation units, to that predetermined number.

19. A printing method according to claim 1,

wherein all lines in the correction pattern are printed based on the same gradation value.

20. A printing method according to claim 19,

wherein an average value, across all lines, of darkness measurement values measured line by line is taken as a target value of darkness; and a correction ratio obtained by dividing a deviation between this target value and the darkness measurement value of each line by the target value is taken as the correction value.

21. A printing method according to claim 16 or 17,

wherein the nozzles can form dots of a plurality of sizes; and the relation between the creation ratios and the gradation values is given for each of the sizes in the creation ratio table.

22. A printing method according to claim 1,

wherein a darkness of the correction pattern is measured optically using a darkness measurement device.

23. A printing method according to claim 3,

wherein the print processes in which the carrying operation differs from one another are print processes in which the pattern according to which the carry amount of each carrying operation changes is different from one another; and

the print processes in which the dot formation operation differs

from one another are print processes in which the pattern according to which the nozzles that is used in each dot formation operation changes is different from one another.

5 24. A printing method for printing an image onto a medium, the method comprising:

printing a correction pattern by ejecting ink from a plurality of nozzles moving in a predetermined movement direction and forming, in an intersecting direction intersecting the movement direction, a plurality
10 of lines extending along the movement direction and constituted by a plurality of dots;

measuring a darkness of the correction pattern line by line; and
printing the image with a plurality of the lines formed in the intersecting direction, while correcting the darkness of each line in
15 accordance with correction values each corresponding to the darkness of each of the measured lines;

wherein a plurality of the lines are formed in the intersecting direction by repeating in alternation a dot formation operation of forming dots on the medium by ejecting ink from a plurality of the nozzles moving
20 in the movement direction and a carrying operation of carrying the medium in the intersecting direction;

a printing apparatus printing the image onto the medium,
includes a plurality of types of processing modes for respectively executing print processes in which at least one of the
25 carrying operation and the dot formation operation differs;

prints, with at least two of the processing modes, a correction pattern corresponding to each of the processing modes on a medium, and has the correction values, which are obtained by measuring the darkness of the correction pattern line by line, in correspondence
30 with each line; and

corrects the darkness of the image line by line, in accordance with the correction values corresponding to each line of the image, when printing the image in any of the processing modes with which the correction pattern was printed;

35 the correction pattern corresponding to each of the processing

modes is printed to fit on a single medium;

a plurality of the nozzles is lined up along the intersecting direction to constitute a nozzle row;

a printing apparatus printing the image onto the medium comprises
5 the nozzle row for each color of ink, the correction value is prepared for each of the colors by printing the correction pattern for each of the colors, and the darkness of the image is corrected color by color, based on the correction values for each of the colors;

the at least two processing modes include at least either a
10 downstream edge processing mode for printing an image at an edge portion on a downstream side, with respect to the intersecting direction, of the medium, and an upstream edge processing mode for printing an image at an edge portion on an upstream side, with respect to the intersecting direction, of the medium;

15 the downstream edge processing mode and the upstream edge processing mode respectively are modes for printing an image provided without a margin at the edge portion;

the correction pattern printed by the upstream edge processing mode is printed at the edge portion on the upstream side of the medium;

20 the correction pattern printed by the downstream edge processing mode is printed at the edge portion on the downstream side of the medium;

the at least two processing modes include an intermediate processing mode for printing an image on a portion between the edge portion on the upstream side of the medium and the edge portion on the downstream
25 side of the medium with respect to the intersecting direction;

the intermediate processing mode and at least one of the downstream edge processing mode and the upstream edge processing mode have a different carry amount in the carrying operation;

there is also a correction value for a region that is judged to
30 be further upstream than the edge portion on the upstream side, or for a region that is judged to be further downstream than the edge portion on the downstream side in the intersecting direction of the medium on which the image is printed;

this correction value is obtained by arranging the medium at a
35 position corresponding to the region, printing the correction pattern

on this medium, and measuring the darkness of this correction pattern line by line;

ruled lines extending along the movement direction for specifying a line during the measurement when measuring the darkness of the correction pattern line by line are formed in the correction pattern at a predetermined spacing in the intersecting direction;

image data for printing the image is prepared, and the image data has a gradation value of the darkness for each dot formation unit formed on the medium;

if a correction value is not associated with the formation units, then a creation ratio corresponding to the gradation value of the formation units is read from a creation ratio table in which gradation values are associated with dot creation ratios, and dots are formed in the formation units on the medium in accordance with the read creation ratio; and

if a correction value is associated with the formation units, then when reading the creation ratio corresponding to the gradation value from the creation ratio table, the creation ratio corresponding to a value obtained by changing the gradation value by the correction value is read, and dots are formed in the formation units on the medium in accordance with the read creation ratio;

the dot creation ratio indicates a proportion of a number of dots formed inside a region that has a uniform gradation value and that is provided with a predetermined number of the formation units, to that predetermined number;

all lines in the correction pattern are printed based on the same gradation value;

an average value, across all lines, of darkness measurement values measured line by line is taken as a target value of darkness; and

a correction ratio obtained by dividing a deviation between this target value and the darkness measurement value of each line by the target value is taken as the correction value;

the nozzles can form dots of a plurality of sizes, and

the relation between the creation ratios and the gradation values is given for each of the sizes in the creation ratio table;

a darkness of the correction pattern is measured optically using a darkness measurement device;

the print processes in which the carrying operation differs from one another are print processes in which the pattern according to which the carry amount of each carrying operation changes is different from one another; and

the print processes in which the dot formation operation differs from one another are print processes in which the pattern according to which the nozzles that is used in each dot formation operation changes is different from one another.

25. A printing apparatus printing an image onto a medium, comprising: nozzles for ejecting ink; and

a controller for making a plurality of the nozzles that move in a predetermined movement direction eject ink to form, in an intersecting direction intersecting the movement direction, a plurality of lines extending along the movement direction and constituted by a plurality of dots, to print a correction pattern, the controller printing the image with a plurality of the lines formed in the intersecting direction, while correcting a darkness of each of the lines in accordance with correction values each corresponding to a darkness of each line in the correction pattern.

26. A printing system, comprising:

a computer; and

a printing apparatus connected communicably to the computer; the printing apparatus including:

nozzles for ejecting ink; and

a controller for making a plurality of the nozzles that move in a predetermined movement direction eject ink to form, in an intersecting direction intersecting the movement direction, a plurality of lines extending along the movement direction and constituted by a plurality of dots, to print a correction pattern, the controller printing the image with a plurality of the lines formed in the intersecting direction, while correcting a darkness of each of the lines in accordance with correction

values each corresponding to a darkness of each line in the correction pattern.

27. A test pattern comprising:

5 a correction pattern constituted by a plurality of lines;

wherein the correction pattern is printed by ejecting ink from a plurality of nozzles moving in a predetermined movement direction and forming, in an intersecting direction intersecting the movement direction, a plurality of lines extending along the movement direction and
10 constituted by a plurality of dots; and

a darkness of the correction pattern is measured line by line in order to obtain correction values each corresponding to the darkness of each line.